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CIRCULAR No. 49 NOVEMBER, 1928
UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

CULTURE AND OUTDOOR WINTER STORAGE OF PERSIMMONS IN THE VICINITY OF PEKING, CHINA

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INTRODUCTION

For centuries the oriental persimmon has been cultivated in Japan and China, the probability being that it was originally grown in China, whence it was introduced into Japan at a very early date. The late Frank N. Meyer found top-worked trees in China that appeared to be very old, and he reported large sections of that country devoted entirely to persimmon culture. In Japan trees are grown singly or in small groves throughout the country.

It is probable that the persimmon is the most commonly used staple fruit in the Orient, its importance being comparable to that of the apple in the United States. During the long period of cultivation in China and Japan many distinct horticultural varieties have arisen and cultural practices have become greatly specialized.

The introduction of the oriental persimmon into the United States is recorded by Prince[2] as early as 1828, and in 1856 Commodore Perry obtained seeds during his epoch-making visit to Japan. These seeds were planted at the Naval Observatory in Washington, D. C., and four years later one of the trees bore fruit. No distribution of seedlings was made, and after a few years the original trees died.

In 1863 another lot of seed was introduced by William Saunders, of the United States Department of Agriculture, and it is reported that at least one of the trees distributed as a result of this importation produced a good crop of fruit. The first introduction of grafted trees, made by the department in 1870, included a number of good varieties, such as Hachiya, Tanenashi, and Yemon. These trees were distributed throughout the Southern States and California. From this time on extensive importations were made from Japan, not only by the department but also by private growers, resulting in the estab-

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[1] J. H. Dorsett died October 8, 1927.

[2] PRINCE, W. A SHORT TREATISE ON HORTICULTURE. 196 p. New York. 1828.

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lishment of the oriental persimmon in California and certain parts of the South.

In 1894 and again in 1895 the United States Department of Agriculture made efforts to introduce living plant material of the large oriental persimmon from the region west of Peking, where it was known to be in cultivation. The pomologist of the department solicited the cooperation of Charles Denby, then United States Minister to China, in this important work. The minister and his son, Charles Denby, jr., then secretary of the legation at Peking, forwarded scions of two varieties, which they reported on at the time.[3] Unfortunately, this material did not survive the long ocean voyage, and it was not until 1905 that the department made another specific attempt to introduce living plant material of the large persimmons from China. In that year Frank N. Meyer, agricultural explorer in the Office of Foreign Plant Introduction of the Bureau of Plant Industry, was successful in importing live scions of the large Chinese persimmon grown commercially in the Ming Tombs region northwest of Peking.

More recent introductions of the Hachiya and nonastringent Fuyu varieties have stimulated greatly the interest of American fruit growers in this new plant introduction from the Orient, and already their cultivation is being extended in parts of the southern United States and more notably throughout California.

PERSIMMON ORCHARDS

Most of the persimmon orchards of northeastern China are located in the foothill areas of the larger valleys and in the more or less level areas along the smaller rivers and mountain streams, appearing at their best in deep, well-drained, decomposed granite or alluvial sandy loam. (Fig. 1.) The trees are commonly planted in rows which are about 30 feet apart, the trees being 20 to 30 feet apart in the rows. The orchards are usually interplanted to smaller-growing fruit trees or to beans or other annual crops and as a rule are kept free from weeds and in a good state of cultivation.

The trees of the commercial varieties in the orchards visited were all ring budded or grafted, usually the former, on seedling trees of what is commonly known among the Chinese as hei tsao (black date), *Diospyros lotus*, which is to be found growing wild in the mountains. Frequently one or two trees are grown in the orchards to supply seed for stock purposes. As a rule the young seedlings are planted in place in orchard form and budded or grafted the second year after setting. The trees are worked at irregular heights from the ground (fig. 1), which may be due primarily to the fact that the practice of budding, as explained to the writers, necessitates selecting the stock of the same size as the scion, so that the ring containing the bud can be slipped from the scion to the stock without splitting the ring, as is usually done in ring-bud propagation in the United States.

The trees inspected averaged 15 inches in diameter, but occasional trees were much larger. One tree measured 68 inches in circumference, and many of similar size were observed. The ages of the trees in the average orchard were generally stated as 75 to 100 years, and a few trees in the Ming Tombs region northwest of Peking were reported to be 400 to 500 years old.

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[3] STUBENRAUCH, A. V., and DENNIS, S. J. THE PRECOOLING OF FRUIT. U. S. Dept. Agr. Yearbook 1910: 437–448. 1911.

As far as could be learned, the Chinese persimmon growers do not practice pruning as do American orchardists with their deciduous fruits, except to remove the dead limbs.

At harvest time a well-kept orchard of oriental persimmons, laden with large golden-yellow fruits, and in fall costume of gorgeous colored foliage, ranging from green through the yellows to the various shades of pink, red, and even dark maroon, is a most glorious spectacle, not uncommon in China, and grander, more beautiful, and even more spectacular than the orange groves of America.

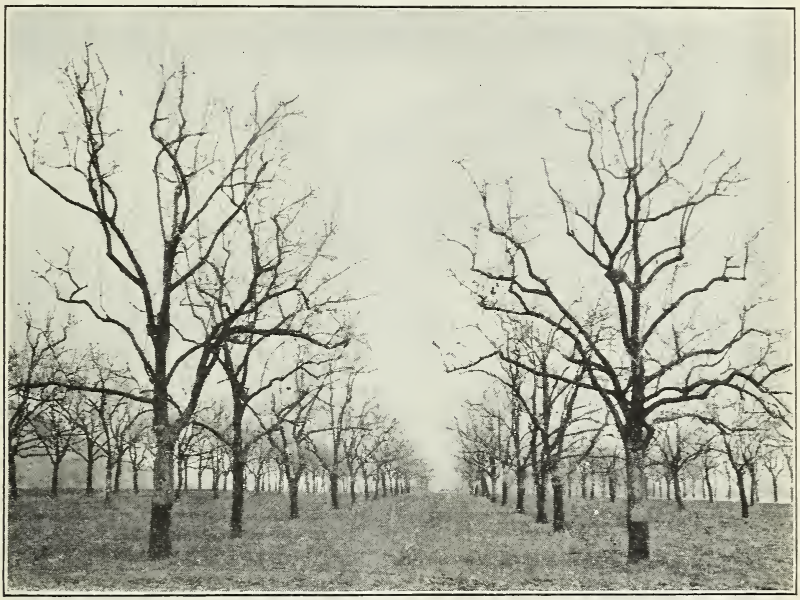

Fig. 1.—A commercial persimmon orchard northwest of Peking, in winter condition. Note the freedom of the ground from litter of any kind, which is characteristic of the orchards at this season of the year, and also the line of union of stock and scion at irregular distances from the surface of the ground

VARIETIES

Frank N. Meyer,[4] after describing a number of persimmons that he procured and introduced, says: "In the Provinces of Shantung, Shensi, Honan, and Chekiang [and he should have included Chihli] there are many varieties of persimmons that are still waiting to be introduced."

In agricultural exploration in the vicinity of Peking only two species of persimmon were seen by the writers. One was *Diospyros lotus* (fig. 2), the small wild persimmon with many seeds, known generally among the Chinese as hei tsao (black date). The fruit of this species, both fresh and dried, is sold in Peking and other markets in considerable quantity, to children and to the poorer classes. The other species, *D. kaki*, is the commercial persimmon, embracing four types of fruit, only two of which are of any great economic importance in that part of China. From a commercial point of view there is little if any real difference in the two types of Chinese persimmons found in abundance in Peking and other markets in northeastern China, except in the size of the fruit and the corresponding difference in price.

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[4] MEYER, F. N. AGRICULTURAL EXPLORATIONS IN THE FRUIT AND NUT ORCHARDS OF CHINA. U. S. Dept. Agr., Bur. Plant Indus. Bul. 204, 62 p., illus. 1911.

Of these types the one in greatest favor and most extensively grown is that known to the Chinese as Ta shih tze (large persimmon). (Fig. 3.) This is probably the same persimmon that Meyer introduced from near Peking, Chihli, China, as Ta mo pan shih tze (large grindstone persimmon). The fruit is flattened, 2 to 3 inches long and 4 to 5 inches in diameter, with an equatorial constriction near the base, and is of a rich golden-yellow color, seedless, of excellent quality and, when fully ripe and soft, nonastringent.

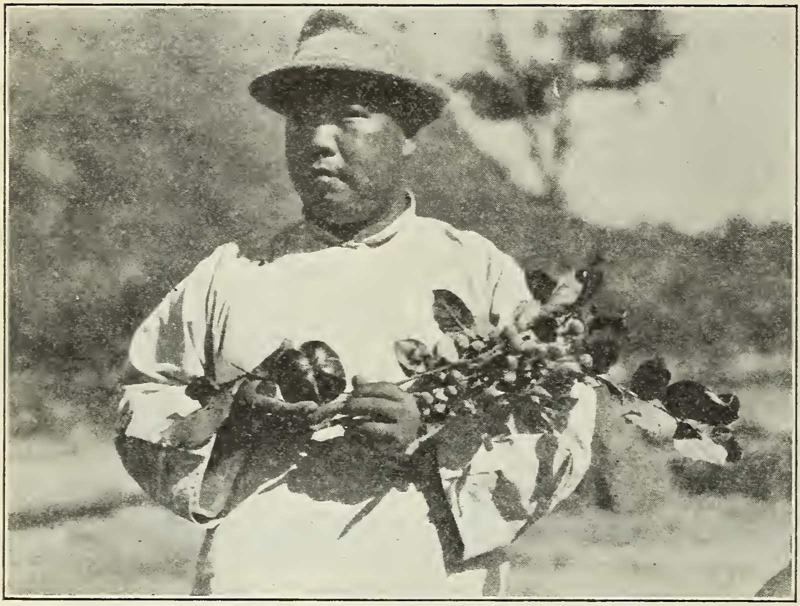

FIG. 2.—A fruit of Teng lung shih tze (lantern persimmon), one of the commercial varieties of northeastern China, and fruiting branches of the native wild species, *Diospyros lotus*. This wild species is commonly known in the region as "black date" and is there used as a stock upon which the commercial varieties are worked

The second (fig. 2) is that known as Teng lung shih tze (lantern persimmon). The fruit of this type, on account of its smaller size, sells in the orchards and at the storage grounds for about one-half the price asked for the larger-fruited type.

The third type, like the first, is also known as Ta shih tze (large persimmon). The fruits of this type, which were seen by the writers but rarely in the markets and only once in the orchards, and then only as a bud sport on branches of the ordinary large-fruited form, were more flattened than the large commercial type but otherwise identical with it.

The fourth type was found in an orchard near the village of Lungtzeting, but not in any of the markets visited. This fruit is small, oblong, 1 to 1½ inches in diameter and 2 to 2½ inches in length, with an equatorial constriction near the base, seedless, and of a golden orange-yellow color. The fruit in general appearance resembles a large bur acorn and is very attractive. The specimens procured by the writers were not ripe enough for judging flavor and quality.

The soil in the orchard from which the last two types of fruit were procured was a rather heavy, friable, reddish yellow clay.

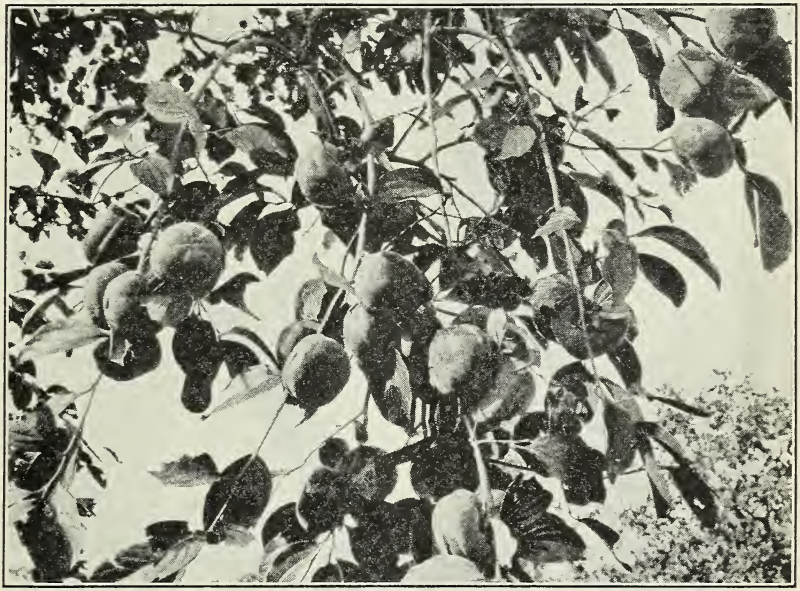

FIG. 3.—Fruiting branches of Ta shih tze, the large Chinese persimmon, in an orchard in the Ming Tombs region north of Peking. This variety is now fruiting in the United States under the name of Tamopan

DISEASES AND INSECT PESTS

The persimmon orchards in the vicinity of Peking were apparently free from diseases, and in only a few instances were infestations of mealybugs observed on the fruits and branches. In these instances this pest was rather abundant and doing some damage. So far as could be learned, no precautions or treatments of any kind were being used to destroy or control this pest.

GIRDLING

The fruit growers of northeastern China often practice girdling to induce shy-bearing plants to produce larger crops and sometimes to increase the size of the fruits. A number of girdled trees of the tsao or Chinese jujube (*Zizyphus jujuba*), a promising new fruit now becoming established in the southwestern United States, were seen. Trees of the Teng lung shih tze (lantern persimmon), mentioned above, while much more vigorous growers than the large-fruited form, Ta shih tze, Tamopan, or large persimmon, are apparently not always good bearers, since numerous trees were seen with girdle marks around the trunks and frequently around the larger branches. However, no trees of the Tamopan type with such marks were noticed.

HARVESTING AND HANDLING

The fruit begins to ripen early in October, and by the middle of the month harvesting is well under way. As a rule, the fruit of the first picking is not fully ripe at this time, and as a result it is more or less astringent. This, however, is overcome by putting the fruit in piles and covering it with dry grass or litter and letting it remain until the astringency disappears, which usually requires from 8 to 10 days.

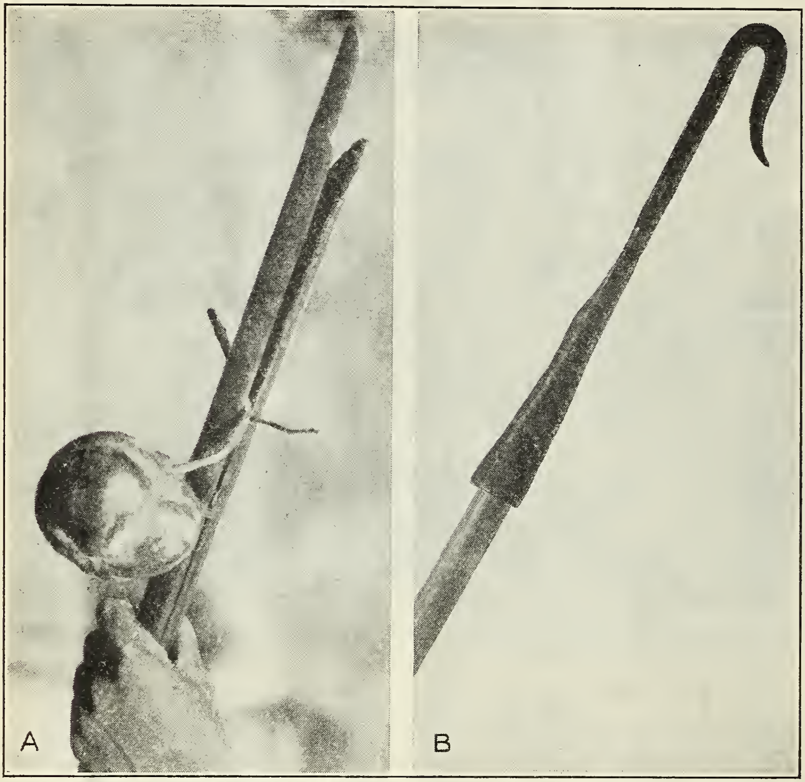

Fig. 4.—Tools used in picking persimmons in the vicinity of Peking, China. A, the split end of a bamboo pole; B, an iron hook on a pole. Both methods of harvesting result in severe pruning

Another way of handling the fruit is to treat it with hot water. The water is brought to a boil, taken from the fire, and the persimmons are then immersed and allowed to remain overnight. When removed and dried, they are ready for market.

Harvesting is done by means of hand picking, and it appears that each region follows its own practice and uses its own special equipment. In the Toli district a bamboo pole, 8 feet or more in length, with one end split, is used. (Fig. 4.) The picker operates this tool from the ground or up in the tree. The split end of the pole is slipped astride the small twig near the fruit, and the picker, with a sudden twist of the pole, breaks the twig. He then slips the pole down through his hand, removes the twig and the attached fruit, and places them on the ground or in a basket in case he is in the tree. When the basket is full it is lowered to the ground by means of a grass rope, and the fruit is emptied into a pile upon the ground. It is not uncommon to see two pickers working together, one up in the tree and the other on the ground. In the Ming Tombs region an iron hook attached to a short pole, about 4 feet in length, is the tool used in picking the persimmons. The man with the pole climbs up into the tree and places the iron hook over the small twig to which the fruit is attached and with a sudden twist, as with the split bamboo pole, breaks the twig. Both twig and fruit fall and are usually caught by a man with a short piece of gunny sacking attached to two short sticks.

Both of these methods of picking the fruit result in severe pruning and remove fruit buds, thereby reducing the yield of fruit for the following season's crop. The pruning resulting from these methods of picking perhaps accounts for the trees not being pruned otherwise.

The harvested fruit is put in temporary piles in the orchards and sold to visiting purchasers. It is also sent by donkey train to near-by shipping points or direct to Peking or other markets. That which is not utilized in this way is stored in accessible storage grounds for winter use.

OPEN-AIR STORAGE

The open-air cold storage of persimmons in the vicinity of Peking is a unique and interesting practice and, so far as known, is peculiar to northeastern China. By this method fruit in good condition and excellent quality may be had throughout the season from October until the middle or last of March. Meyer [5] records the following observations on the winter storage of persimmons:

> By careful handling and by keeping the persimmons at a low temperature they can be preserved for several months. To keep them through the winter, the Chinese pile them in heaps, let them freeze thoroughly, and keep them frozen until they are needed. When wanted, they are simply put into a vessel with cold water, to be thawed slowly, and they are then as good as when freshly picked. They can also be eaten when slightly frozen like sherbet, and occasionally are quite acceptable in that condition.

It is difficult to realize that practically the entire winter's supply of persimmons grown in the vicinity of Peking, amounting to many millions of fruits, is stored in beds, on the ground in the open, along the terraced river banks, in the orchards along the streams, in village compounds, and on river bottoms of sand and gravel, without protection of any kind other than a bed of kaoliang stems (a variety of sorghum) beneath and a covering of a single thickness of reed-grass matting which, after the fruit is frozen, is supplemented with a covering of dry mountain grass or other available litter to a depth of about 2 feet.

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[5] MEYER, F. N. Op. cit.

The storage grounds are, as a rule, located in places not only advantageous for the handling of the fruit from the orchards where it is grown, but also for the transportation of the frozen fruit by donkey or camel trains to the markets during the winter. The storage grounds are sometimes owned or leased by a fruit grower with extensive orchards or by one or more men who own or lease the storage grounds and purchase the fruit from the near-by growers and look after its storage and marketing. Sometimes the growers pool their interests and harvest, store, and market the fruit cooperatively. Each storage ground is provided with a watchman who has a hut near by and who, with his dog and a long-handled spear, makes his rounds at regular intervals, to see that all is well and that none of the fruit is being carried away by robbers.

The storage beds (fig. 5) are simple affairs, usually about 12 feet in width and of any desired length. The bed is prepared (fig. 6) by digging four trenches, which, with the dirt taken from them and piled on the sides, are about 12 inches in depth and about the same in width. A bed of kaoliang stems 3 to 4 inches in thickness is laid across the ridges, and upon this the fruit is placed by hand, in regular layers, generally six persimmons deep, sometimes fewer, but never more. (Fig. 7.) The five bottom layers are placed with the stems of the fruit down, while the top layer is placed with the stems up. In some sections, especially in village compounds, timbers or logs are laid on the ground and take the place of the earth ridges, and the bed of kaoliang stems is rolled down over them. After the beds are filled with persimmons, kaoliang stems or other available litter is put about the ends and sides of the beds to protect the fruits from injury. They are then covered with a single thickness of reed-grass matting, which in some instances is tied down with small grass rope, while in others it is weighted down with small stones to

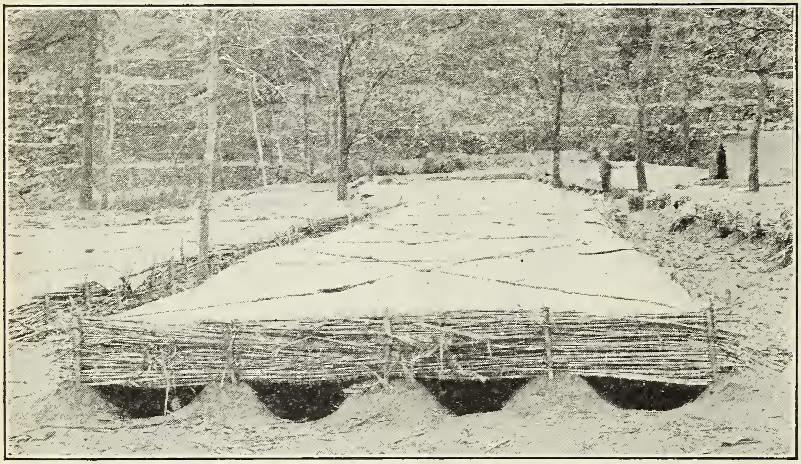

FIG. 5.—A persimmon cold-storage yard in an orchard 60 miles northwest of Peking. The sides and ends of the beds are protected with kaoliang stems, and the beds are covered with a single thickness of reed-grass matting, tied in position with hand-made twisted rope or grass. After the fruit is frozen this covering is supplemented by a loose covering of dry grass or other available litter to a depth of about 2 feet

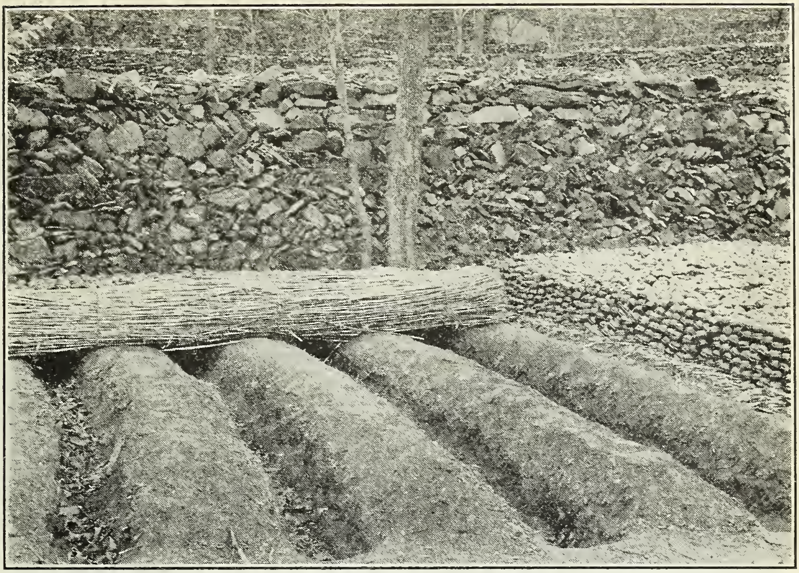

FIG. 6.—The ridges and furrows of an open-air cold-storage persimmon bed with the mat of kaoliang stems, 3 or 4 inches in thickness, ready to be rolled down over them. On this bed the fruit is placed in regular layers, usually six fruits or less deep. The lower layers are placed with the stem of the fruit down, but the top layer is placed with the stem up

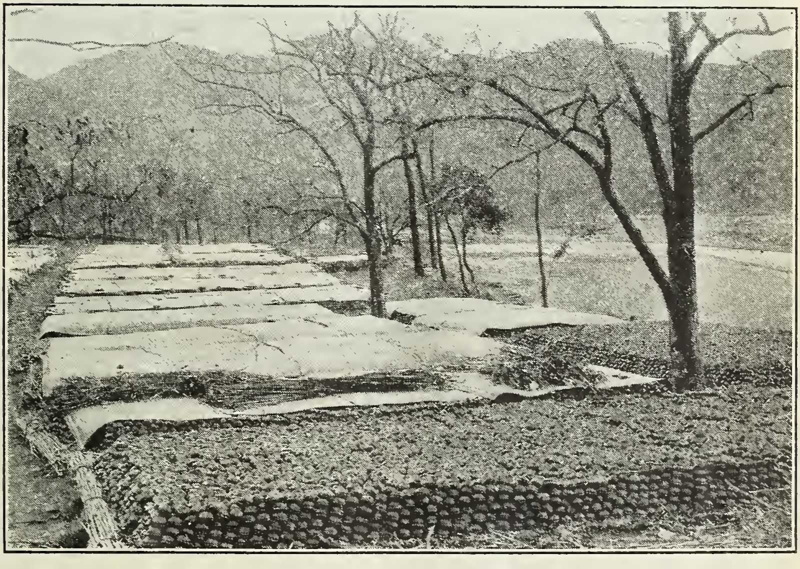

FIG. 7.—Covered and uncovered persimmon beds in an open-air cold-storage yard in a persimmon orchard on the bank of Clearwater River, China. These beds each contain 16,000 to 20,000 persimmons

prevent its being carried away by the wind. After the persimmons are frozen, this covering is supplemented by from 18 to 24 inches of loose, dry grass or other litter.

Men at the storage grounds explained that the trenches and spaces under the persimmon beds were for drainage in case of rain or snow. However, it is probable that their greatest importance is to allow a circulation of air which, in the fall, assists in reducing the temperature of the fruit in the beds, and in the winter insures a more even freezing than otherwise would be possible.

In one locality, near the village of Panpitien, above Toli, the writers saw persimmons bedded down in a mixture of dry grass and leaves and covered with reed-grass matting supported over the beds on a low A-shaped frame made of kaoliang stalks. This was on March 8, 1925. The owner of the small storage yard was reluctant to uncover any portion of the beds, claiming that on account of the lateness of the season the fruit, when exposed to the air, would have a tendency to turn dark, thus reducing its market value.

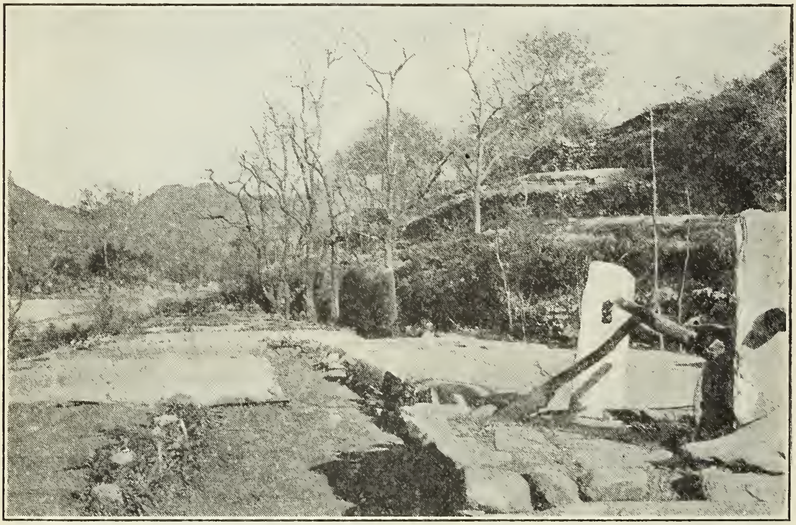

FIG. 8.—Open-air persimmon winter-storage beds on a terraced river bank above Toli, about 60 miles northwest of Peking, China. The grass mat coverings are in some instances tied down with small handmade grass rope and in others weighted down with small stones. This is to prevent their being dislodged by the wind. Later in the season, after the fruit is frozen, an additional covering of about 2 feet of loose dry grass or other litter is added to guard against the thawing of the fruit due to temperature variations throughout the storage season (November to March)

An approximate idea of the importance of the persimmon industry in the vicinity of Peking and the extent to which open-air cold storage of the fruit is practiced may be gained from the fact that in a walk of a day and a half up the small valley of Clearwater River, above Toli, about 50 miles northwest of Peking, storage beds were seen which were estimated to contain from 7,000,000 to 8,000,000 persimmons, and it was said that more than 10,000,000, or slightly more or less than 2,500 tons, were in storage in that one small valley. (Figs. 8 and 9.)

MARKETING

The marketing of persimmons begins early in October, even before the fruit is fully ripe and when artificial means have to be employed to get rid of the astringency in order to make it at all edible, and continues until the open-air cold-storage beds are exhausted, which in some seasons is as late as the last of March. The Chinese persimmon growers thus have a market season of nearly five months. Probably this season could be extended indefinitely by American growers, through modern cold-storage methods.

The fruit is transported from the orchards in the early fall to near-by railway stations and markets, and even to quite distant markets, by men with carrying baskets; also by camel and donkey trains, especially the latter. During the winter the fruit, in a frozen state, is transported from the open-air winter cold-storage beds by means of donkey and camel trains, especially the latter, for long hauls, and is delivered to the purchaser in a frozen condition, to be thawed out by the retailer as the demand requires.

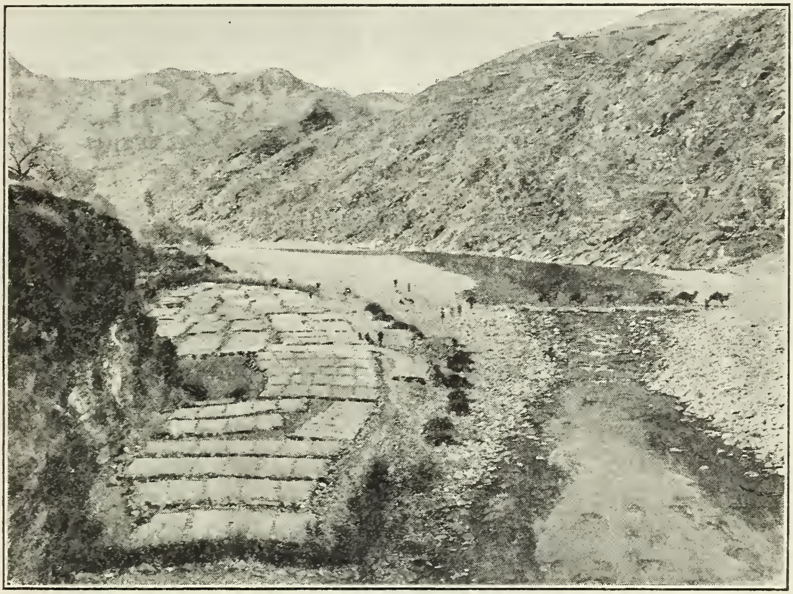

FIG. 9.—A persimmon cold-storage yard on a sandy, gravelly river bottom, northwest of Peking. The matting covers are here weighted in position with small stones. It is estimated that 1,500,000 persimmons, or approximately 175 tons, are stored in this one yard

The numerous fruit stands in the Peking markets and on the streets are filled with this popular fruit, which sells at reasonable prices, 3 to 5 coppers, local currency, per fruit, throughout the entire season. Americans and Europeans in China are generally fond of this fruit, and with these foreigners the persimmon as a breakfast fruit is as popular as the grapefruit is in the United States.

CONCLUSION

A careful survey of the persimmon industry in the Orient appears to warrant the statement that this fruit deserves a more prominent place in American horticulture.

There are a number of species and many varieties of persimmons distributed throughout the world, especially in Japan and the great domain of China, and efforts should be made to introduce as many of these as possible for use in extending this industry in the United States. This goal can be attained only by determining the varieties and stocks best adapted to different regions and the commercial sorts best suited for cold storage and freezing. This is an important work which should be carried forward as promptly as possible.

The winter outdoor cold storage of persimmons as practiced by the Chinese in the vicinity of Peking justifies the belief that through American methods of cold storage (freezing) of American-grown oriental persimmons their market season could be materially prolonged and they could even be marketed around the world. In other words, the markets of the world would be opened to American-grown oriental persimmons.

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